

# Simulation of Interference Effects from UWB Sources on a Narrowband Digital Transmission System

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**Abstract**—This paper studies the interference effects from 4 types of ultra wide band (UWB) sources on a narrowband  $\pi/4$ -shift differential quadrature phase keying (DQPSK) transmission system by simulation. The culprit UWB sources were: multi-band orthogonal frequency-division multiple-access (MB-OFDM), direct-sequence code-division multiple-access (DS-CDMA), DS spread spectrum UWB (DS-SS UWB), and additive white Gaussian noise (AWGN). The MB-OFDM and DS-CDMA were modeled based on the proposal specifications in the IEEE.802.15.3a to standardize high-speed wireless personal area networks. Average bit error rates (BER) degradation of the victim system was evaluated in the presence of the UWB signals as a source of interference. We propose a modified equivalent baseband system to accelerate the simulation speed. In the proposed system, the victim system was generated in the passband domain, while the UWB signals were generated at the equivalent baseband domain to lower the sampling rate of the simulation. It was found that the interference effects of the UWB signals were almost equivalent to that of an AWGN. However, since the MB-OFDM marks spectral peaks at every 3.2 MHz in the frequency spectrum, it severely degraded the BER performance in the victim system. The amplitude probability distributions of the UWB signals were dependant upon the frequencies that enters the victim's receivers.

**Keywords**—Ultra wide band, MB-OFDM, DS-CDMA, interference, equivalent baseband, amplitude probability distribution